

Economic Impacts

of

**The Petition for Proposed Amendment of ARM 17.24.116 Pertaining to
Hard Rock Mining Application Requirements for Operating Permits**

**Prepared by
Montana Department of Environmental Quality
January 2006**

Mining Rule Economic Impact Statement

Executive Summary

This document estimates the economic impact to Montana of the proposed amendment of ARM 17.24.116. If the proposed rule were enacted, adverse economic impacts would fall mainly on several industrial sectors within Montana. These sectors include metal mining (e.g. gold, silver, copper), industrial mineral mining (including talc and limestone), and parts of Montana's economy closely associated with these industries. Benefits from the rule would include a lower risk (or prevention) of taxpayers having to pay water treatment costs into perpetuity if mine reclamation bonds calculated by the state prove insufficient. Benefits would also include improved water quality near affected mines, increased protection of the environment near future mining activity, and possibly new jobs from additional water treatment during mine life.

As a result of adopting the proposed rule as currently written, an estimated 50-90% of future metal mining economic output and 10-25% of future industrial mineral mining economic output in Montana would be prevented from developing. Overall, these two mining sectors comprise 1.5% or less of Montana's total economy in terms of jobs, wages, output and tax revenue. Therefore, the state economy as a whole would be not significantly affected. However, mining's prominent history in Montana culture, its concentration in select counties, and the fact that mining jobs are high-paying would ensure that local significant effects occur. Based on current mine locations and where future mines would likely be located, Lincoln, Sanders, Jefferson, Madison, Beaverhead and Silver Bow counties would be most affected by this proposed rule. The proposed rule would result in an estimated 740 to 2600 jobs lost or not created, \$47 to \$138 million in wages lost each year, \$84 to \$543 million in economic output lost each year, and \$7.1 to \$16.5 million in tax revenue lost each year. The domestic supply of talc in the U.S. might be significantly reduced.

Background

This document estimates the economic impact to Montana of the proposed amendment of ARM 17.24.116 (from here on, the 'proposed rule'). If the proposed rule were enacted, adverse economic impacts would fall mostly on several industrial sectors within Montana. These sectors include metal mining (e.g. gold, silver, copper), industrial mineral mining (e.g. non-metal mining such as talc and limestone), and parts of Montana's economy closely associated with these industries. These adverse impacts would mainly occur in five or six specific counties including Lincoln, Sanders, Jefferson, Madison and Beaverhead counties. Beneficial impacts of the rule would affect water quality and quantity, water users near affected mines, , and potentially taxpayers as well.

In this analysis, two scenarios are developed: 1) What mining in Montana would be like in the future under current law and 2) What it would be like in the future under the proposed rule. The difference between these two scenarios is the estimated negative

economic impact of the proposed rule. The positive economic impact would be the savings to taxpayers from avoiding the need for perpetual water treatment.

This analysis is driven by assumptions because it is impossible to know exactly what will happen in the future with mining in Montana. The assumptions are based upon available information, the experience of Montana Department of Environmental Quality (DEQ) staff and other experts, and best professional judgment. In Montana, statistics for the mining sector are compiled in a manner to include metal mining, industrial mineral mining, coal mining and mining-related support activities. Because metal mining and industrial mineral mining would be primarily affected by this rule, it is those two economic sectors that are focused upon. For the purposes of this impact statement, industrial mineral mining includes talc and various types of stone such as rip rap, limestone and associated cement plants, basalt, and shale. Industrial mineral mining does not include bentonite and other minerals regulated under the Opencut Act such as sand, gravel, peat, and soil. Coal is regulated under the Montana Strip and Underground Mine Reclamation Act.

Assumptions for the Economic Impact Statement

General Assumptions Concerning the Proposed Rule

- The proposed rule would become effective in 2006.
- The proposed rule would affect those mines regulated by the Metal Mine Reclamation Act (MMRA) which includes all metal mines and certain industrial mineral mines such as talc mines and limestone quarries. The rule would not cover gravel pits, scoria, or bentonite operations.
- Most rock pickers, small quarries, small hard rock mines, garnet and other placer operations would not be affected by this rule.¹ Most of these operations would be covered under Small Miner Exclusion Statements.
- Under the proposed rule, mines applying for a new permit or an expansion under the MMRA would not be allowed, starting two years after the completion of their operations, to treat surface or ground water for carcinogens or toxins in order to meet water quality standards at any point of water discharge. In other words, mine-related water at the point of discharge would have to meet water quality standards without treatment two years after the mine closes.
- Toxic and carcinogenic pollutants as defined by WQB-7, including nitrates, would be subject to the proposed rule (See Appendix A for a list of these pollutants).
- The currently permitted actions of the six large metal mines in Montana would be grandfathered and not fall under this petition. These mines include Montana Resources (copper, molybdenum), Montana Tunnels (zinc, lead, silver, gold), Golden Sunlight (gold), Troy (silver, copper), Stillwater Nye (Platinum Group Metals—palladium, platinum), and Stillwater East Boulder (Platinum Group Metals—palladium, platinum). These mines make up a large portion of current

¹ Stated with the understanding that some rock pickers, placer operations, and garnet mines disturb more than five acres and therefore require operating permits.

total mining activity in Montana---they represent over 90% of metal mining activity in the state in terms of total economic output.²

- Other current operating permits on small mining operations in Montana would be grandfathered and not subject to the proposed rule.
- The rule would apply to the proposed Rock Creek Mine and proposed Montanore Mine in the Cabinet Mountains. These two mines might open in the next five years under current law.
- Nitrate from explosives residues produced in connection with mining talc, chlorite, limestone, basalt, and shale and other apparently non-reactive rocks or minerals would be subject to the proposed rule.
- Mines that use explosives could be affected by this rule due to the potential for nitrate exceedances in surface water from explosives residue.
- Starting two years after a mine closes, this rule would eliminate mixing zones for mine-related discharged water based on the language in the rule that would require the water discharge to meet standards at the point of discharge.
- Because wastewater treatment would be forbidden starting two years after closure, wastewater treatment plants at mines would also be forbidden starting two years after closure.
- Currently operating mines that have no water discharge or no water quality exceedances would not be affected by the proposed rule. These make up a relatively small portion of Montana's total metal and industrial mineral mining activity, and include stone quarries and mines, rip-rap operations, rock pickers, and placer mines which would be exempt from the rule anyway.

Assumptions about Future Mining in Montana Under Current Law and Under the Proposed Rule

- Adverse effects on state revenues and economic activity from the proposed rule would include effects on in-state metal production, economic output, employment, personal income, secondary economic business from mining, the metal mines tax, the gross and net proceeds taxes, mine property taxes, the state tax on corporations, and individual income taxes. It could also affect revenues paid to and jobs available at the Montana DEQ as well as recipients of Resource Indemnity Trust fund allocations.
- Beneficial effects from the rule could include maintenance of water quality (and associated ecological benefits), fewer water quality issues down-gradient from mines, less chance of inadequate bonds at taxpayers expense, and less environmental damage overall from mining.
- Existing allowed mining technology would continue to be used by the mining industry.
- Current metals prices, which are high compared to recent norms, would continue to prevail.

² One of the primary economic indicators that is used in this document is economic output. Economic output is the value of goods and services produced in an economy which is typically calculated as the quantity of goods and services sold times the prices of those goods and services.

- The economic contribution of future mining in Montana will be similar to past and current trends with the understanding that the industry is very cyclical and can significantly vary from year to year.
- There would not be any new, significant mineral discoveries in Montana beyond what is currently known.
- The Montana Resources and the Montana Tunnels mines are representative of future open pit metal mines operations in Montana. The Troy and Black Pine mines are representative of future underground mine operations in Montana.
- Exploration projects and/or development projects including Montanore and Rock Creek (underground copper and silver), Lowland Creek (open pit copper and molybdenum), Broadway-Victoria (underground silver) and Cannivan Gulch or Bald Butte (open pit and/or underground molybdenum) will be typical of potential future mining projects in Montana as opposed to projects like Zortman, Basin and Kendall which would be illegal today because of the cyanide ban.
- The currently permitted remaining life for each of the six large, grandfathered, metal mines in Montana is the following: Montana Resources--15 years, Montana Tunnels--2 years, Golden Sunlight--3 years, Troy--3 to 4 years, Stillwater Nye--20 years, and Stillwater East Boulder--20 years. These numbers are taken from current permitting documents and do not necessarily represent the actual potential mine life or total amount of ore or mineralized material known or remaining at these sites.
- Any of these six mines could apply for expansions to their operating permit which could extend their operating life if approved. If the proposed rule became law, any expansions granted after the proposed rule became effective would be subject to the proposed rule.³
- Based on the remaining life of their permits, three of the six grandfathered metal mines will end current operations in the next 10 years. These include the Troy, Golden Sunlight, and Montana Tunnels mines.
- Under current law, one of these three mines in the next 10 years will apply for a new permit to expand their operations beyond 2016. The other two mines will close down within 10 years (by 2016).
- The expanded mine, under current law, will end operations and close during the 2016-2026 period.
- This expansion would be prevented from happening by the proposed rule.
- By 2016, one of the two proposed mines in Montana's Cabinet Mountains will begin operations under current law.
- The proposed rule would prevent or discourage this mine from opening, or it would delay this mine indefinitely.
- Under current law, other new mining projects in Montana will develop slowly and incrementally, as it will take some time for these potential deposits to be permitted and developed.
- One additional large metal mine, in addition to either Rock Creek or Montanore, will open in the next 10 years under current law, for a total of two large new metal mines opening in the next 10 years in Montana under current law.

³ With the possible exception of Montana Resources which may or may not discharge water from any expansion that they undergo and which may fall under an EPA Superfund vs. DEQ legal jurisdiction issue.

- This additional large mine would not open under the proposed rule.
- The two new metal mines opened under current law in the 2006-2016 time period will be up to full operation in the 2016-2026 period, and a third new major metal mine will open under current law in the 2016-2026 period. This third mine would not be able to open under the proposed rule.
- In order to examine a range of possibilities, a scenario is also assumed where no new major metal mines will open in Montana in the next 10 years under current law.
- By 2026, the remaining three grandfathered metal mines will be closed or near the end of their lives.
- Some undeveloped but known mine deposits in Montana will not be developed in the near future under any circumstances due to various economic and/or political factors. Therefore, these mines (e.g. open pit gold mines that would require cyanide use to be economic or mines proposed in controversial locations) will not be affected by the proposed rule.
- The metal mining industry in Montana is currently about 6 times larger than the industrial mineral mining industry (as defined above) in terms of economic output and this ratio will continue in the future.⁴
- Those who desire to exploit undeveloped metal mine deposits in Montana that could feasibly be developed in the future, would closely study the rule if it were adopted, the geology and setting of their ore bodies, and the economics of their situations before making a decision whether to apply for a mining permit.

Baseline Economic Analysis: What Mining Would Look Like in the Future Under Current Law⁵

This section first examines what mining looks like today and what it looked like in the recent past. A range of numbers is then estimated for what mining will look like in the future under current law.

Metal Mining

Currently, metal mining in Montana is concentrated at six mines in five counties: Jefferson, Lincoln, Silver Bow, Stillwater and Sweet Grass. These counties are located in the northwest, central and south central portions of the state and the mines are situated near the towns of Jefferson City, Whitehall, Troy, Butte, Big Timber and Nye. Jefferson County contains two of the six large mines. The major metals produced at these mines include copper, gold, lead, molybdenum, palladium, platinum, silver and zinc. Two potential large metal mines that may open in the next five years would be located in Lincoln and Sanders counties near the towns of Libby and Trout Creek. Montana is the

⁴ IMPLAN model, Minnesota IMPLAN group.

⁵ Susan Ockert, Montana Department of Commerce, Census and Economic Information Center (November and December of 2005) is responsible for much of the writing and compiled data in this baseline section.

only state in the U.S. with palladium and platinum production, ranks 4th nationally in gold production, 4th in zinc and lead, and 7th in silver.⁶

Today, there are over 2,000 employees in the metal mining industry in Montana and these workers earn over \$100 million annually.⁷ These workers also earn job-related benefits, and produce over \$300 million annually in economic output. Metal mining's impact on Montana's economy reaches beyond these numbers. To keep the mines operational, electricity, machinery, equipment, and other supplies are required, and these suppliers benefit from the mines. In addition, the mining and suppliers' employees spend their wages on groceries, gasoline, clothing, furniture, homes, and other purchases required to maintain their lifestyle. These wages thus produce an 'induced' economic effect.

In 2002, the most recent year of reliable data, Montana's metal mining industry directly employed 2,128 workers and supported an estimated additional 1,815 jobs from induced effects.⁸ Its wages paid out that year were \$113 million and it supported an estimated additional \$44 million in wages. Total economic output was \$327 million with an estimated additional \$153 million in economic output supported by the industry. Rounding these numbers, the estimated average annual total induced effects from metal mining today in Montana are about 1,800 jobs, \$45 million in wages, and \$150 million in output.⁹ Precious metal mining, which includes gold, silver, palladium and platinum, is by far the largest subsector in the metal mining industry. At the other end of the scale is iron ore mining with only 5 employees (at a mine which has been closed and reclaimed since 2002).

Today, employee compensation for miners averaged \$53,000 while compensation for all employees tied to the metal mining industry averaged about \$40,000 (Department of Labor and Industry, Research and Analysis Bureau web site). In 2003, the average wage per job in Montana was \$26,869 (U.S. Bureau of Economic Analysis, Regional Economic Accounts, Table CA-34)). In 2005 dollars, this would be around \$28,800. Clearly, metal mines jobs are very high paying in Montana compared to the average wage paid in the

⁶This data is taken from Montana Bureau of Mines and U.S. Geological Survey (2003), <http://minerals.usgs.gov/minerals/pubs/state/mt.html>

⁷ Information for this paragraph was compiled by Susan Ockert and is taken from Employment, Compensation, and Output numbers derived from IMPLAN, an economic modeling software program. IMPLAN is produced by the Minnesota IMPLAN group (www.implan.com).

⁸ Ibid.

⁹ Those industries with the highest output tied to the metal mining industry include manufacturing, health care, and utilities. From an employment standpoint, the metal mining industry supports an estimated 272 workers in health care, and 249 workers in retail, including those that work at grocery stores, motor vehicle and parts dealers, department stores, and online auction sites. This is part of the 1,815 additional jobs created. Other employment supported by this industry includes bankers (finance and insurance), lawyers and accountants (professional, scientific & technical services), waiters and waitresses (accommodations and food services), teachers (educational services), and artists (arts, entertainment and recreation). Mining operations require large amounts of electricity and fuel. An estimated \$14 million of power generation plus over \$8.8 million of petroleum refinery products are consumed by the metal mining industry (IMPLAN model).

state for all jobs (84% higher).¹⁰ With the current high commodity prices for metals, output per worker today averages over \$150,000. Output per worker for all industries supported by metal mining averages \$121,000 (Susan Ockert, Montana Dept. of Commerce).

Approximately \$13.5 million is collected annually in state-level taxes on Montana metal mining. Property tax revenue currently collected at the state level in Montana from metal mines is approximately \$4.0 million annually under current law (with fluctuations in that amount occurring from year to year). Most of the property tax assessed to metal mine operations is on their business equipment (Montana Department of Revenue, Tax Policy and Research, December, 2005).¹¹ The gross proceeds tax collected on all metal mines was \$4.43 million in 2004 and \$3.67 million in 2003.¹² The tax collected was \$4.02 million for tax year 2002 and \$4.06 million in tax year 2001.¹³ Thus, a reasonable average amount collected for the gross proceeds tax today is estimated to be \$4.0 million a year. The metalliferous mining tax collected in FY2004 for Montana was \$5.57 million and averaged \$5.52 million annually from FY 1998 to FY 2004 (Montana Dept of Revenue, Biennial Report, 2002-2004). \$5.5 million is the average used for today's annual collection.

These three major metal mines taxes (property, gross proceeds, metalliferous mining) add up to about \$13.5 million per year in average tax revenue from metal mines. It is assumed that future amounts will average about the same (using 2005 dollars). Estimating the state corporation tax collected from mines is beyond the scope of this paper, but the amount collected annually is small compared to the \$13.5 million figure. Of this \$13.5 million, about \$5.0 million is distributed to the state general fund, \$3.7 million to counties and local government, \$1.0 million to special accounts under the metalliferous tax, \$3.6 million to schools, and \$0.2 million to other miscellaneous accounts.¹⁴

¹⁰ In this paper, when a number is converted into 2005 dollars, the 'U.S. Department of labor, U.S. Labor Statistics, Consumer Price Index for all Urban Consumers' is used to make that conversion.

¹¹ During FY 2005, the five largest metal mines in Montana had a total taxable value of \$8.99 million on their property (Montana Department of Revenue, Tax Policy and Research, December, 2005), and data for the sixth was not available. Rounding up to \$10 million in total taxable value for all metal mines (in order to include the contribution of the sixth big metal mine and all other small metal mines), and multiplying that number by the average mills as collected under the gross proceeds tax, 425 mills, it is estimated that \$4.25 million in property taxes were collected for metal mining in 2004. \$4.0 million is used as a conservative annual average.

¹² Montana Dept of Revenue Biennial Report, 2002-2004, pp. 115 and 119

¹³ Montana Dept of Revenue Biennial Report, 2000-2002. p. 110 and 115

¹⁴ Currently, 58% of metalliferous mines tax revenue is deposited in the state general fund; 8.5% in the hard-rock mining reclamation account; 7% in the reclamation and development grants account; 2.5% in the hard-rock mining impact trust account; and 24% to the county or counties identified as experiencing fiscal and economic impacts under an impact plan. If no such plan has been prepared, that same 24% goes instead to the county in which the mine is located (MCA 15-37-117). Part of the 8.5% that goes into the hard-rock mining reclamation account is distributed to the Montana DEQ (under certain circumstances) which will be discussed later. The metal mines gross proceeds tax is Class 2 of the property tax and is allocated to taxing jurisdictions based on their mill levies. General property taxes collected from mines are allocated to taxing jurisdictions based on their mill levies.

TABLE 1-Metal Mining and its Current Economic Contribution in Montana

	Direct Effects	Induced Effects
Jobs	2,128	1,800
Total Annual Wages	\$113 million	\$45 million
Annual Economic Output	\$327 million	\$150 million
Annual Tax Revenue	\$13.5 million	--
Metal Output	Only Platinum Metals Group mines in U.S., 4 th in U.S. in gold, zinc and lead production, 7 th in U.S. in silver	
Counties most supported by metal mining	Jefferson, Stillwater, Sweetgrass, Silver Bow	
Average Wage	\$53,000	

Industrial Mineral Mines

The economic sub-sector of industrial mineral mining that falls under the Metal Mine Reclamation Act includes talc and various types of stone such as rip rap, limestone and associated cement plants, basalt, and shale. To reiterate, industrial mineral mining in this impact statement does not include minerals regulated under other acts, such as sand, bentonite, gravel, coal, peat, and soil. Currently, industrial mineral mining in Montana is located in many counties in the southern and western portions of the state. The largest operations are located in Madison, Beaverhead, Broadwater, and Gallatin counties. These include three talc mines, and three talc processing plants. Major limestone operations are located in Jefferson, Broadwater, Gallatin, and Carbon counties, with major cement plants near Montana City and Three Forks.¹⁵

With just under 400 employees in the industrial mineral mining sector, these workers earn almost \$8 million, and produce over \$45 million in economic output¹⁶. Like metal mining, industrial mineral mining's impact on Montana's economy reaches beyond these numbers. Montana's industrial mineral mining sector directly employs 394 workers (U.S. Department of Labor, Bureau of Labor Statistics, Quarterly Census of Employment and Wages) and supports an additional 172.¹⁷ It directly compensates employees \$7.7 million with an additional \$4.1 million supported by the industry. It directly contributes \$45 million in economic output and supports another \$17 million. Rounding these numbers, the estimated average annual induced effects from industrial mineral mining

¹⁵Some of this data is taken from Montana Bureau of Mines and U.S. Geological Survey (2003), <http://minerals.usgs.gov/minerals/pubs/state/mt.html>

¹⁶ Information for this paragraph (except where indicated) was compiled by Susan Ockert and is taken from Employment, Compensation, and Output numbers derived from IMPLAN, an economic modeling software program. IMPLAN is produced by the Minnesota IMPLAN group (www.implan.com).

¹⁷ From an employment standpoint, the industrial mineral mining industry supports 65 workers in health care, 79 workers in retail, and 46 transportation workers, including 27 truck drivers. Other employment supported by this industry includes bankers, lawyers and accountants, waiters and waitresses, teachers, and artists. Those industries with the highest output tied to the industrial mineral mining industry include transportation, manufacturing, and utilities. Mining operations require large amounts of electricity and fuel, and several million dollars of power consumption and petroleum refinery products are attributed to the industrial mineral mining industry (IMPLAN).

today in Montana are about 175 jobs, \$4 million in wages, and \$17 million in output. Employee compensation for mineral mines workers averages around \$31,000 while compensation for all employees tied to the industrial mineral mining industry averages about \$28,000.

The net proceeds tax covers industrial mineral mines. The net proceeds tax collected in Montana from industrial mineral mines was \$3.02 million in tax year 2004, and \$2.88 million in 2003.¹⁸ It was \$2.93 million in 2002 and \$2.62 million in tax year 2001.¹⁹ \$3.0 million is a reasonable average annual amount of taxes collected today on mineral mines. The net proceeds of miscellaneous mines is subject to mill levies of those taxing jurisdictions in which the mine is located and is distributed as such. The tax is distributed on the basis of relative mills levied by all jurisdictions levying taxes in the area. Because some of the non-metal mines are small, it is impossible to estimate the property taxes they pay. Currently from industrial mineral mines, using the \$3.0 million average annual tax collection, about \$0.65 million is distributed annually to the state general fund, \$0.9 million to counties and local government, \$1.36 million to schools, and \$0.08 million to other miscellaneous accounts.

TABLE 2-Industrial Mineral Mining and its Current Economic Contribution in Montana (2002 data)

	Direct Effects	Indirect Effects
Jobs	394	175
Total Annual Wages	\$7.7 million	\$4 million
Annual Economic Output	\$45 million	\$17 million
Annual Tax Revenue	\$3.0 million	--
Mineral Output	1st in the U.S. in Talc	
Counties most supported	Madison, Beaverhead, Jefferson, Broadwater, Carbon	
Average Wage	\$31,000	

Metal and industrial mineral mining make up a small percentage of Montana's economy—less than 2% for all economic indicators. Metal mining and industrial mining put together average about 1.3% of total economic output in Montana today.²⁰ The two industries together average about 0.5% of total jobs in Montana today (U.S. Bureau of Economic Analysis, Regional Economic Accounts, U.S. Census--2002 Economic Census). From 1997 to 2004, the two industries together have averaged 1.0% of Montana's total wage and salary disbursement. Overall tax revenue from both types of mining is just under 1% of total annual tax revenue collected in Montana, although it comprises a larger percentage of local tax revenue collections in counties most affected by mining. The \$12.5 million collected annually for the three mining related taxes (gross proceeds, net proceeds, metalliferous mines) is about 6% of total natural resources taxes

¹⁸ Montana Dept of Revenue Biennial Report, 2002-2004. p. 115 and 119

¹⁹ Montana Dept of Revenue Biennial Report, 2000-2002. p. 110

²⁰ U.S. Bureau of Economic Analysis, Regional Economic Accounts. Montana's total economic output is measured as Gross State Product. Gross State product is a measure of the total value of goods and services produced in a particular state. Because Gross State Product is essentially the same thing as economic output, these two measures can be used together and are referred to interchangeably as economic output.

collected in the state of Montana today. Natural resource taxes totaled just under \$150 million in 2004 and included large sums of money from coal, gas and oil (Montana Department of Revenue, Biennial Report 2002-2004, p. 33).

Ranges for Baseline Economic Data

The numbers derived so far provide averages for current economic activity in Montana as a result of metal and industrial mineral mining. It is assumed that these numbers are good averages to use for estimated future mining activity under current law. It is, however, important to use ranges around these average job, wage and output numbers in order to estimate future mining economic activity in Montana. The reason for this is that estimated future numbers will determine the estimated economic impact of the proposed rule, and a range of numbers allows a number of possibilities based on an unknown future. Examples of unknowns in this analysis include a future mining boom versus a future decline, and the amount of mining that would be affected by the proposed rule.

It is impossible to predict future long-term booms or busts in Montana's mining industry because the mining industry is so cyclical and subject to worldwide economic forces. As an alternative, the past 25 years of available data are used to develop ranges for key economic numbers. Metal and industrial mineral mining employment, wage and output numbers from 1977 to 2002 are used to determine ranges for future mining estimates in Montana under current law.²¹ In most cases, the second highest and second lowest years from 1977 to 2002 are used as the upper and lower range numbers for jobs, total annual wages and total annual output. For a few of these numbers, other techniques are used where appropriate. The average numbers derived above from today's mining operations fall somewhere in these ranges. Estimating ranges for future tax revenue is beyond the scope of this paper, so current numbers are used. All numbers presented in these ranges are given in current dollars.

It is important to note that mining jobs, wages and economic output in the past few years (2001-2005) fall towards the lower end of the range they have experienced from 1977 to 2002. On the other hand, current metals prices are high and currently continue to rise for metals like gold, silver, lead, copper, platinum and zinc. Some of these prices are at record highs²². If gold and other metals mining activity increases in Montana under current law as a result of these prices, then using a range of values allows for the possibility of a future mining boom in Montana, just as it allows some room for the possibility of a downturn in future Montana mining (especially considering the recent cyanide ban).

²¹ This historical data was compiled by Susan Ockert, Montana Department of Commerce, Census and Economic Information Center November 2005. This data was obtained from the U.S. Bureau of Economic Analysis, Regional Economic Accounts. 2002 is the most recent year of reliable data.

²² In a recent Reuters report (December 8, 2005), it is stated that gold prices are likely to remain strong in the near term, that prices are at their highest levels in more than 24 years, and that gold still has upside price potential.

The following two tables present the estimated ranges of future metal and industrial mineral mining economic activity in Montana under current law. Again, the numbers are reported in 2005 dollars. Appendix B at the end of this paper gives more detail on how these ranges were developed.

TABLE 3-Metal Mining and the Estimated Range of its Future Economic Contribution in Montana (in 2005 dollars)

	High Estimate	Low Estimate
Long-Term Jobs	2,785	1,378
Total Annual Wages	\$150 million	\$92 million
Annual Economic Output	\$582 million	\$160 million
Annual Tax Revenue	\$13.5 million	--

Data source: U.S. Bureau of Economic Analysis, Regional Economic Accounts

TABLE 4- Industrial Mineral Mining and the Estimated Range of its Future Economic Contribution in Montana

	High Estimate	Low Estimate
Long-Term Jobs	636	350
Annual Wages	\$12.4 million	\$7.7 million
Annual Economic Output	\$77 million	\$41 million
Annual Tax Revenue	\$3.0 million	--

Data source: U.S. Bureau of Economic Analysis, Regional Economic Accounts

Adverse Economic Effects (Costs) of the Proposed Rule

General

As a result of the rule, 50-90% of future metal mining economic output and 10-25% of future industrial mineral mining economic output in Montana would be prevented from developing (assuming current technology). The derivation of these percentage ranges is discussed shortly. Overall, the mining that would be affected comprises 1.5% or less of Montana's economy in terms of jobs, wages, output and tax revenue. Therefore, the state economy as a whole would be not significantly affected. However, mining's prominent history in Montana culture, its concentration in select counties, and the fact that mining jobs are high-paying would ensure that local significant effects occur. Based on where current mines are located and where future mines would likely be located, Lincoln, Sanders, Jefferson and Silver Bow counties would be most affected by this proposed rule, plus any other county where a major future mine would not be able to open or an existing mine would not be able to expand. Job loss, personal income loss, local tax revenue loss, and secondary business loss from the proposed rule would be concentrated in these counties. Cumulative effects from the current downward trend of other extractive industries could exacerbate these adverse effects. The Stillwater mines would likely be able to expand even under the proposed rule, so that Stillwater and Sweetgrass counties would likely not feel significant effects from the rule.

The counties and towns most affected as well as mining workers and their families would experience adverse psychological and emotional costs to the extent that their livelihoods were forgone. On the other hand, almost all of those workers would find other work eventually, and the costs would likely diminish within a year or two. Alternative work might involve costs such as moving and/or taking lower pay.

Mining company owners and executives (many of whom live outside of Montana) would forgo some of their future profits from mining. Stockholders in the publicly traded companies might experience lower returns on their investments as a result of the rule. These stockholders reside nationwide and are not necessarily concentrated in Montana.

As a result of the proposed rule, fewer tons of metals would be available for U.S. and world consumption. As mentioned earlier, the major metals found in Montana include gold, silver, copper, zinc, palladium, platinum, molybdenum, and lead. The major industrial minerals found in Montana that could be affected by this rule include talc, limestone, other types of stone, basalt, and shale.²³ The only metals and minerals currently mined in Montana that constitute a significant U.S. share of the market are talc, palladium and platinum. Palladium and platinum mines in Montana would likely not be affected under the proposed rule. Thus, the consumption and the uses of metals as a result of the proposed rule would not be significantly affected on a national or world scale. The amount of talc produced in Montana is significant on a national scale (36% of U.S. production in 1993). Therefore, any affect on Montana's talc mines could have a significant effect on talc supply at a national level, although substitutes are likely available.

The way that certain types of mining are done in Montana would have to change. As a result of the rule, some mine operators and managers would have to consider additional costs before opening a new mine or expanding operations at an existing mine. Feasibility studies done on these projects would have to take into account increased operational controls of nitrates, and would have to consider developing facilities with liners above and below waste rock dumps, tailings impoundments, and other deposits of mine wastes that could leach pollutants. Mill sites and loadout facilities might also need to be encapsulated to prevent the potential for the treatment of seepage from these facilities and thus eliminate flows at closure.

²³ Copper is used in electric cables and wires, switches, plumbing, heating, construction, and pharmaceutical machinery. Gold is used in dentistry and medicine, jewelry and arts, medallions and coins; in ingots as a store of value, and for scientific and electronic instruments. Silver is used in photography, chemistry, jewelry, electronics, as currency, in lining vats and other equipment for chemical reaction vessels, in medicine, as a catalyst in manufacturing, and for dowries and other expressions of prosperity in some cultures. Zinc and lead are used in numerous manufacturing and construction applications. Platinum and palladium are used principally in catalysts for the control of automobile and industrial plant emissions, in jewelry, in bushings for making glass fibers used in fiber-reinforced plastic and other advanced materials, in electrical contacts, and in capacitors ('Facts About Minerals', Mineral Information Institute, <http://www.mii.org/commonminerals.html>). Talc is used for the manufacture of catalytic converters, controlling the whiteness of paper, and can be used as part of the anti-blocks that are found on plastic films. Basalt and shale are used for railroads and road-bed material.

These additional requirements would add to costs and reduce profits of affected mining operations. The feasibility studies done by project developers would consider these additional costs and this would in some cases affect the decision to mine or not. On a lesser scale, it might affect the decision of what ore grade is economically feasible, and thus affect how large a mine could be. It is important to note that some mines would not open as a result of the proposed rule, and some current mines would not expand because it would be technically or economically infeasible to meet the proposed rule.

The mines most affected by this rule would include future silver, copper, (non-cyanide using) gold, and molybdenum mines as well as at least one talc mine. A primary reason that these types of mines would be most affected by the proposed rule is because the water runoff or drainage inherent in these types of operations (with the exception of talc) can produce metal leaching caused by acid rock drainage (ARD). Metal leaching leading to violations of water quality standards can also occur in a near-neutral pH environment. It may be impossible with metal leaching to have discharge water that meets all standards two years after mine closure. The reason is that most metal leaching leads to water discharge with one or more pollutants that exceed standards. Not all mines would have this problem. Observation, lab work, and analysis have led the DEQ to conclude that relatively low-sulfide deposits such as Troy, Rock Creek, and Montanore do not, or would not, produce ARD. Nevertheless, near-neutral mine discharge water from these deposits would carry trace amounts of copper in excess of standards indefinitely (in addition to nitrate for a period of years), and therefore these kinds of operations also might not be permitted or allowed to expand under the proposed rule.

It is also important to note that the proposed rule could prevent permitting or expansion of mining operations that have neither of these problems but that use explosives. Mines that use explosives could be affected by this rule due to the potential for nitrate exceedances in surface and ground water from explosives residue. The most commonly used explosive in mining is ANFO, a mixture of ammonium nitrate and fuel oil. Blasting leaves a residue of nitrate, which can bleed into mine waters, and may cause exceedances of water standards until it attenuates over a period of years. This could be a problem for mining-related rock piles near or over creeks or drainages. This nitrates issue could apply to most metal mines in Montana and to at least one talc mine. It could also apply to other operations where rock is mined for cement production, building material, riprap or aggregate that otherwise do not have water problems. For those future mines that would not shut down under the proposed rule, this rule could mean some short-term and intensive water treatment would be required while a mine is operating that would not be required under current law.

Problems have been observed with other parts of the mining industry that have not been mentioned here and could be affected by the rule. There is the potential for the milling reagents used for some operations to exceed water quality standards as cyanide did. Other products used in the mining and milling process could also cause problems in the same way that nitrates would from blasting. The DEQ has also encountered problems to date with chromium from cement kiln bricks, arsenic from underground railroad ties treated with wood preservatives and byproducts from diesel spills during operations.

Finally, there is the potential for waste rock removed to access ore to contain at least one parameter that exceeds water quality standards, such as the potential for fluoride or thallium to cause problems.

In addition to future mines being affected, some existing mines with active operating permits would likely not be able to expand beyond current operations under the proposed rule. These mines include both metals and non-metals operations. Examples of larger mining operations that might not be able to expand include the Treasure Mine (talc), the Troy Mine, Golden Sunlight Mine, and Montana Tunnels Mine. The two Stillwater mines would likely still be able to expand under the proposed rule due to the quality of the water they discharge, but the mines could be affected because mine water carries nitrates and the new rule would require compliance at the point of discharge.²⁴

It is also important to note that mining-related exploration activities in Montana could be immediately curtailed by this rule. If the perception of would-be investors as a result of the proposed rule, is that future mining would not be feasible and/or desirable in Montana, then exploration could drastically drop off leading to further adverse economic effects from the rule.

Effects on Metals Mining

Using best professional judgment, it is estimated that, in the long run, 50-90% of future metal mining economic output in Montana would be prohibited by this rule. In other words, it is estimated that the total economic activity from metal mining in Montana would eventually be reduced by 50 to 90 percent as a result of this rule as compared to what could occur under current law. Economic output includes expansions of existing mines and exploration and support activities for future mines. It would take some time for this 50-90% effect to fully take place, and thus the estimated effects in the first 20 years after the rule went into law (2006-2026) would be substantially less than the estimated 50 to 90 percent range. On the low end of that range, about half of mining activity would continue (as compared to what would happen under current law) with likely increased water treatment costs, and about half of mining would not occur because mines would not be able to meet the requirements of the rule. On the high end of the range at 90%, the vast majority of hard rock mining that would occur in the future under current law would not occur under the proposed rule.

Effects of the rule through 2016

In 10 years time (2016), the reserves cited for three of the six current large metal mines in Montana will probably have been exhausted. These include the permits for the Troy,

²⁴ Stillwater's discharge water is good quality because they treat it. The operations have one of the most advanced nitrate treatment plants in the world. If the water were not treated, they might have a nitrate problem. After closure, the underground mine will take longer than 2 years to fill and it is unknown how long it would take nitrates to flush out of the backfill. The Stillwater mine at Nye may still have an exceedance for a short time when the shaft finally discharges. They are permitted to discharge 100 pounds of nitrates per day. The mining company certainly wouldn't exceed that limit but the question remains as to whether it would be required to meet standards at the shaft point of discharge.

Golden Sunlight, and Montana Tunnels mines. It is assumed for this analysis that in the next 10 years under current law, one of these three mines will apply for a major amendment to expand and operate beyond 2016. It is assumed that this expansion would be prevented by the proposed rule. The other two mines will close down by 2016 regardless of the rule. It is assumed for this analysis that by 2016, one of the two proposed mines in the Cabinet Mountains will begin operations under current law, and that the proposed rule would prevent or discourage this one mine from opening, or delay it indefinitely.

Under current law, other new mining projects in Montana are expected to develop slowly and incrementally, as it will take some time for these potential deposits to be permitted and developed. It is assumed that one additional large metal mine will open in the next 10 years under current law, for a total of two large metal mines opening in the next 10 years under current law. It is assumed that this additional large mine would not be able to open under the proposed rule. In order to examine a range of possibilities, a scenario is also assumed where no new major mines will open in Montana in the next 10 years under current law (instead of two new mines opening).

In the best case scenario for mining, the least costs as a result of the proposed rule, through 2016, no new mining projects or major expansions will be started in the next ten years under current law, and therefore the proposed rule would have almost no impact on metals mining in the next 10 years except for the possible effect of lowering exploration activities. In the most costly case scenario through 2016, the proposed rule delays or prevents one of the two proposed Cabinet Mountains mines from opening, prevents an additional new major mine from opening, and prevents the one mine expansion from happening. The other three grandfathered mines continue as they would under current law.

So, from 2006-2016 under current law, an average of six major metal mines operate in Montana (three grandfathered and continuing, one expanded, two new mines and two that close down over that time). Under the proposed rule, an average of three to four major metal mines operate in Montana (one out of six is eventually prevented from expanding, and the two new mines are prevented from opening). In addition, mining exploration slows significantly. The two new mines affected by the rule would be either in the initial stages of operation or nearly ramped up to full production by 2016, so they initially have less of an effect on Montana's economy through 2016 than the fully operational mines that are already up and running.

Based on these assumptions, the most costly scenario would affect up to 40% of metal mining economic output in Montana by 2016 and less than that in the years between 2006 and 2016. Taking into account the least costly and most costly scenario for metals mining, and the fact that these adverse effects would take time to occur, the proposed rule would decrease metals mining by 0-30% over the entire 10 year period from 2006 to 2016, with up to 40% of mining being prohibited (relative to what would occur under current law) by the year 2016. This would translate over the next 10 years (using job, wage and output numbers in the middle of their estimated future ranges) into a loss of \$0

to \$98 million annually in metal mines economic output, 0 to 655 jobs lost, and \$0 to \$34 million lost annually in wages (plus associated worker benefits lost).²⁵ From \$0 to \$4.1 million would be lost in total annual taxes from metal mining over the next 10 years. Secondary effects would also be felt by related industries. Lincoln and Sanders Counties plus an additional county with a new mine would bear the majority of the adverse effects. The additional county would be somewhere in Western or Central Montana where existing deposits are located.

Effects from 2016-2026

From 2016-2026, it is estimated that the proposed rule would decrease metal mining economic output by approximately 30-60% over the entire 10 year period of 2016-2026, with up to 60% of metal mining gone by the year 2026 as a result of the rule. It is assumed for this analysis that the two new metal mines opened under current law in the 2006-2016 time period would be up to full operation in the 2016-2026 period, and that another major metal mine would open under current law in the 2016-2026 period. As with the other two new mines, the new mine opened in the 2016-2026 period would not open under the proposed rule. The existing mine that expanded in 2006-2016 under current law would end operations during this 2016-2026 time period. It is assumed that the Stillwater mines would stay open through 2026 and would either close shortly after that time or expand (regardless of whether the rule becomes law). Exploration activities in Montana would continue to be discouraged by the rule.

To sum up the most costly scenario for the 2016-2026 time period, under current law, six or seven major metals mines would be operating on average (six mines are operating in 2016 under current law, a new one opens during this time bringing the total up to seven, and the expanded mine closes bringing the total back down to six). Under the proposed rule, only three major metal mines would operate (the two Stillwater mines and Montana Resources) with the possibility that one or both of the Stillwater mines could expand by this time. Thus, four out of seven major mines operating in this time period under current law would be closed as a result of the proposed rule (one expanded mine, three new mines), and the remaining three might incur some minor increased costs. So, up to 60% of metal mining economic output could be prohibited by 2026. A less costly scenario might see half of these effects or a 30% drop in metal mining over this time period due to changes in the assumptions made (such as no new metal mines in 2016-2026 even under current law, that one of the three mines is able to open under current law, or innovative ways could be found for mines to expand or open under the proposed rule using current technology).

A decrease in metal mining by approximately 30-60% on average over the entire 10 year period of 2016-2026 would translate (using job, wage and output numbers in the middle of their estimated future ranges) into a loss of \$98 to \$196 million annually in metal mines economic output, 655 to 1,310 jobs lost over 10 years, and \$34 to \$68 million lost annually in wages (plus associated worker benefits lost). From \$4.1 to \$8.1 million

²⁵ Job and wage numbers are decreased proportionately by the same amount as economic output numbers. These losses are in comparison to what would happen under current law.

would be lost annually in total taxes from metal mining over 10 years. Adverse secondary effects would also be felt. Lincoln and Sanders counties plus an additional two counties with the new mines would continue to feel the brunt of the adverse effects. If Jefferson County included the mine that would be prohibited from expanding, then Jefferson County would also experience adverse effects.

Long Term Effects

After 2026, all six currently grandfathered mines will have closed, and anywhere from half to almost all new metal mines in the state that would occur under current law would be either prevented from opening because of the proposed rule or would incur greater costs. This would lead to a 50% to 90% drop in metals mining economic output as a result of the proposed rule in the long run. If a mine were to close or not be developed because of the rule, labor unions at mines that are unionized would close and cause further economic costs, although this effect would be small compared to metal mining as a whole. Industries associated with metal mining would also be adversely affected.

The economic effects of the rule on metal mines would depend upon which numbers were used in the range of numbers estimated for future mining activity under current law. In the long run, the direct effects on total output from Montana metal mining would range from \$164 to \$294 million lost annually (using the mid-level number in the output range) with effects as high as \$524 million loss in annual output if future metal mining booms under current law (coupled with a 90% decline as a result of the rule) and effects as low as \$80 million loss in annual output if future metal mining declines under current law (coupled with a 50% decline as a result of the rule). Indirect effects on other Montana industries related to metal mining would range from 900 to 1,620 jobs lost, \$23 to \$41 million lost annually in wages, and \$75 to \$135 million lost annually in economic output. In the case of a 90% loss of \$294 million in economic output annually, 1% of future expected total Montana economic output (gross state product) would be lost. If the number were \$524 million in a future mining boom scenario, then 2% would be lost.

The effects on metal mining jobs would range from 1092 to 1965 jobs lost (using the mid-level employment number) with up to 2,500 potential jobs lost if future metal mining booms under current law (coupled with a 90% decline from the rule) and as few as 689 jobs lost if future mining declines under current law (and experiences a 50% decline). Under the scenario of 90% loss from the proposed rule and 1965 jobs, less than 0.5% of future expected Montana total employment would be lost. The wage effects from lost metal mining would range from \$57 to \$102 million lost annually with up to \$135 million lost if future mining booms and as low as \$46 million lost if future mining declines. Under this worst-case scenario, 1.1% of future expected Montana total wages and salary would be lost. To calculate induced losses from related industries, the economic numbers of the economic activity supported by metal mining (discussed earlier) are multiplied by 70%, the average of 50% and 90%.

Up to \$12.21 million a year would be lost in tax revenue to Montana if 90% of metal mining was lost and \$6.79 million if 50% of mining were lost. In the worst case scenario,

less than 1% of total taxes collected in Montana would be lost due to the proposed rule. Using the distributions of the gross proceeds, metalliferous mines tax, and property taxes, and using average mill distributions for all counties (not including city mills), in the worst-case scenario, \$4.5 million would be lost to the state annually, \$3.36 million to the counties and local government, \$0.9 million to special accounts, \$3.28 million to schools, and \$0.2 to miscellaneous mills (Montana Dept of Revenue Biennial Report, 2002-2004, pp. 113 and 114)²⁶.

The counties within which the affected mines and/or deposits are located would be affected significantly by bearing most of the county and local effects. As an example, during the 5-year period of 1999-2003, about \$320,000 of Montana Tunnel's \$1.18 million in total taxes was paid out annually in property taxes. The taxes charged to the mine by Jefferson County in 2003 comprised 6% of the total \$8.88 million real property tax charge to all of Jefferson County, and 7% of the \$9.99 million total real property tax charged in 2004 (Patty O'Neill, Treasurer of Jefferson County). In this same time period, the mine contributed between 29% and 33% of the total tax funding received by the Clancy elementary school district, and an average of 10% of the total received by the Boulder High School district (O'Neill, Patty 2004).

TABLE 5-Estimated Economic Loss to Montana as a Result of the Decrease in the Metal Mines Sector Under the Proposed Rule

	Most Costly Case*	Mid Level Case	Least Costly Case**
Jobs Lost	2,500	1092 to 1965	689
Annual Wages Lost	\$135 M	\$57 to \$102 M	\$46 M
Annual Economic Output Lost	\$524 M	\$164 to \$294 M	\$80 M
Tax Revenue Lost		\$6.8 to \$12.2 M	
Induced Effects from Related Industries	Average annual loss: 1260 jobs, \$32 M wages, \$105 M econ. output		
Other Effects	Loss of metals for U.S. and world use-No significant losses Certain counties bear most of costs, psychological costs		

M=Million

*Most costly case assumes a future mining boom under current law and a 90% loss as a result of the rule

**Least costly case assumes a future decrease in mining under current law and a 50% loss as a result of the rule

Effects on Industrial Mineral Mining

It is estimated that 10-25% of future industrial mineral mining would be adversely affected by this rule. Talc mines would be affected the most by the proposed rule. As a result of the rule, less talc would be available for national and world consumption. The only significant effect this might have is to moderately affect the national supply of talc

²⁶ In the best-case scenario, only \$2.5 million would be lost to the state annually, \$1.86 million to the counties and local government, \$0.5 million to special accounts, \$1.82 million to schools, and \$0.1 to miscellaneous mills

(less than 10% decrease in future national supply). Current talc operations such as the Treasure Mine would likely not be able to expand under the proposed rule, and the largest, the Yellowstone Mine, might be limited in its expansion potential. In general, hard rock mines such as limestone quarries would not be affected by the proposed rule due to the fact that they typically have no water discharges. Rock quarries in general (including limestone quarries) would not be affected.²⁷

Talc mining and other miscellaneous categories make up 2/3 of total economic output for the industrial mineral mines sector (stone making up the other 1/3), and an estimated 15-33% of talc mining would be prohibited in the future as a result of the proposed rule. Thus for the sector overall, there would be a 10-25% reduction in industrial mineral mines economic output as a result of the proposed rule. This percentage range applies to all talc and hard rock mining that falls under the MMRA. In economic terms, these numbers translate into about 50 to 120 jobs lost (or up to 160 jobs lost if mineral mining booms), \$0.8 to \$3.1 million lost annually in wages, \$4 to \$19 million lost in economic output, and up to \$0.75 lost annually in taxes. To calculate induced losses from related industries, the economic numbers of the other industries supported by mineral mining (discussed earlier) are multiplied by 18%, the average of 10% and 25%.

TABLE 6-Estimated Economic Loss to Montana as a Result of the Decrease in the Industrial Mineral Mines Sector Under the Proposed Rule

	Most Costly Case*	Least Costly Case**
Jobs Lost	120	50
Annual Wages Lost	\$3 M	\$1 M
Annual Economic Output Lost	\$19 M	\$4 M
Tax Revenue Lost	\$0.75 M	\$0.3 M
Induced Effects	Average annual loss: 31 jobs, \$0.7 M wages, \$3 M econ. output	
Other Effects	A moderate effect on U.S. talc supply (less than 10%)	

M=Million

*Most costly case assumes a future mining boom under current law and a 90% loss as a result of the rule

**Least costly case assumes a future decrease in mining under current law and a 50% loss as a result of the rule

Effects on the Department: Effects on the Montana DEQ from the proposed rule would consist of reduced mining-related revenues to the Department and possibly resulting in fewer DEQ jobs (no more than 5-10 jobs lost) due to less mining activity. Fee reductions to DEQ would be a result of 1) the reduced ability of future mines (through their payment of taxes) to pay back reclamation bonds that DEQ has previously issued and those likely

²⁷ Montana has no quarries at this time that produce discharges with nitrates. Only one operating talc and one closed chlorite mine currently have had nitrate problems in Montana. The potential exists for quarries to have nitrate problems in the future. Larger industrial mineral mining operations are the ones that will have nitrate problems that last for more than two years. As Montana grows, it is likely that there will be fewer large operations in Montana and thus less effect from this rule.

to be sold in the future, and 2) less revenue paid into the Resource Indemnity Trust (RIT) Fund, a portion of which goes to DEQ.

The impact to DEQ from less RIT revenue would be approximately \$350,000 per biennium or \$175,000 per year. Multiplying this number by 50-90% would give a total effect from the proposed rule of \$88,000 to \$158,000 per year lost to DEQ from less RIT funds.²⁸ Less money going into the RIT fund would not only impact DEQ, but also several DNRC programs, the state library, the Governor's Office and some local districts. To the extent that the metalliferous mines tax was reduced by the proposed rule, the state general fund would pick up the responsibility of retiring bonds for the purpose of doing reclamation work when bonding is inadequate.²⁹ It is beyond the scope of this impact statement to estimate the dollar amount loss that would occur from a reduction in other mining-related revenues DEQ receives. The Montana Bureau of Mines and Geology and Montana Tech could be affected as well by fewer mines, but no FTE cuts are expected.

Another cost to the department could be the need to make the conclusive demonstration of no treatment required after two years called for in the proposed rule. Given the complexity of large mineralized systems and the minute amount of actual material which could be tested in a reasonable amount of time, it would be difficult, if not impossible, for regulators to guarantee that a large mine would not have at least one constituent that would exceed standards and require either a mixing zone or treatment after a period of two years following closure. Scientific studies allow reasonable conclusions or inferences to be drawn, but not guarantees.

Benefits of the Proposed Rule

Benefits from the rule would include a lowering of the chance (or prevention) of taxpayers having to pay water treatment costs into perpetuity after mine bonds run out. The State of Montana and ultimately taxpayers could benefit from the proposed rule because mines with long-term water treatment requirements would not be permitted limiting the risk that reclamation bonds would be inadequate to cover water treatment

²⁸ The metalliferous mine tax (MMT) is distributed to 5 separate funds. One of those funds is the Reclamation and Development state special revenue account (RDGA)²⁸. This account receives revenue from other sources as well, including "interest" from the RIT (trust). Appropriations from this fund are legislatively approved for many uses within state government including uses within DEQ for the Hard Rock Program, Opencut Program, and Coal Program in the Permitting Division, Legal Unit, and Enforcement Division. If metalliferous mine taxes completely disappeared, the impact on the RDGA would be approximately \$525,000 per year or \$1,050,000 per biennium. The RDGA has a biennial appropriation across state government of \$11,980,987 and DEQ's appropriation from this account is \$3,341,547 for the 06-07 biennium or approximately 1/3 of the total appropriations. The statute does not state which appropriations are funded first but it is assumed that the revenue impact would be distributed equitably across all of the state's programs with appropriations. Thus, the impact to DEQ would be approximately \$350,000 (\$1,050,000/3) for the biennium or \$175,000 per year. 50-90% of this number would give a total effect from the proposed rule of \$88,000 to \$158,000 per year lost to DEQ.

²⁹ 8.5% of the MMT is deposited into the Hard Rock Bond Issuance Account (02988). This account gives authority to the Board of Examiners to issue bonds for the purposes of doing reclamation work when bonding is inadequate and there is no one to go to for money. These bonds are General Obligation bonds.

costs in the future. For certain mines in the past, this taxpayer burden has been significant. It is important to note, however, most of the mines that have cost taxpayers in the past could not be permitted under current law as they would be illegal today. Therefore, this taxpayer benefit may not be as significant as it would have been in the past. So, although the situation at Zortman and Landusky is not directly relevant due to the current ban on cyanide heap-leach mining in Montana, water treatment at these mines has proven to be substantially more costly than anticipated in the bonds established during 1996. Available funding from the bonds, from 2007 through 2017, totals \$731,321 per year. Anticipated water treatment expenses exceed this level by approximately \$750,000 per year. Beginning in 2007, no funds are currently identified which would address this discrepancy. Also, less enforcement would be needed for violations on future mining projects that don't open and this would save taxpayers money. Also, less remedial action in general may be needed in the future with fewer mines.

Another potential benefit is that Montana might also be seen as more attractive to new residents and to tourists if the rule passed. More residents could be seen as a benefit or as a cost to current residents of Montana. Any Montanans that move into the state seeking a clean environment as a result of the rule could offset some of the economic loss to mining (as a result of the rule) from their very presence and socio-economic diversity. Likely, few people would actually move to Montana solely based on the rule, but perhaps as a result of several developments including the rule. Existing residents might also see the rule as making their state more attractive. The rule would also be a benefit by better protecting human and aquatic life (and could result in fewer human health advisories). The size of that benefit would be small on a state-wide basis as water quality standards must already be met under current law, and those standards are already designed to protect human and aquatic life. The increment of water quality improvement from the rule would likely be small on a state-wide basis, but could be significant in local areas downstream from mines. It can be argued that other past efforts to protect state waters such as the recent cyanide ban (I-137, I-147) have made a much larger beneficial impact on water quality than this rule would. Also, if new types of mining were developed in order to comply with the rule, mineral exploration activities might actually increase over current levels.

Another benefit to society as a whole would be the fuel, electricity, tires, machinery and other equipment saved as a result of less mining. This energy and equipment would be available for other projects in the U.S. economy or could simply be conserved. As an example, large industrial tires used in mining are currently in short supply in the U.S. for large industrial applications, and could be valuable to economic activity elsewhere if future Montana mines did not open.

Other emotional, psychological and political benefits would accrue to various classes of individuals, depending on their points of view. Environmental groups would likely view the rule positively as would the Fort Belknap Reservation and perhaps some people that live out of state. Fewer people working at DEQ would save a very small amount of taxpayer money.

Summary of Benefits and Costs of Proposed Rule

TABLE 7-Summary of Benefits and Costs of Proposed Rule

Benefits	Costs
<ul style="list-style-type: none"> • Lowering of taxpayer risk of having to pay for perpetual water treatment • Less enforcement and remedial action needed as a result of fewer mines • Increased protection of human and aquatic life (locally) • Increased attractiveness of Montana to existing and future residents • New jobs from additional water treatment during mine life • Savings of fuel, electricity and equipment from fewer mines • Emotional benefits to certain classes of people in and outside of Montana 	<ul style="list-style-type: none"> • 50-90% of future metal mining and 10-25% of industrial mineral mining prohibited under the rule • 740 to 2600 jobs lost • \$47 to \$138 million in wages lost each year • \$84 to \$543 million in economic output lost each year • \$7.1 to \$16.5 million in tax revenue lost each year (costs borne roughly evenly by state general fund, county and local government, and schools) • Induced impacts on other industries of 1,300 jobs, \$33 million in wages and \$108 million in econ. output • Emotional costs to workers, counties, towns, and rule opponents • No significant reductions in U.S. metal supply • U.S. talc supply moderately reduced

Alternatives to the Proposed Rule:

- Exempt nitrates from the proposed rule. If nitrate-nitrite and ammonia-nitrogen were left out of the rule, the effects on industrial mineral mines would be eliminated, and thus change the analysis. Any potential effects of the rule on the two Stillwater mines would also be eliminated. The adverse effects of the proposed rule would therefore be up to 5% lower if nitrates were taken out, although the main effects from the rule on metal mines would largely go unchanged.
- Clarify the department's authority under 82-4-336 (3) to provide "a longer period" before discharged water has to meet standards. In this case, the effects on metal mines could be reduced, if better defined allowable time periods longer than two years were set for each mine.
- Increase bond levels for long-term water treatment (see Section 4.2 of the accompanying Alternatives Analysis prepared by HydroSolutions).
- For mines, alternatives to ANFO exist for explosives, but are more expensive, and may create different water quality problems. Emulsions, one alternative to

ANFO, are 2-5 times more expensive, and break down over longer periods of time. Military surplus explosives are not a predictable source of supply, and along with nitroglycerine and dynamite, can increase the cost of explosives by a factor of 5-10. Blasting techniques and handling can also be modified to reduce nitrates, but that topic is beyond the scope of this analysis.

- Allowing mixing zones and nitrate impacts under the rule would allow some mines to have minor exceedances of some metals. These mines could be permitted and still comply at the mixing zone boundary without treatment.

Efficient Allocation of Public and Private Resources

The alternatives listed above would result in a more efficient allocation of public and private resources than the proposed rule. They would prevent water pollution while allowing for development of some ore bodies that would not be developed under the proposed rule.

References

IMPLAN Model, 2005, Employment, compensation, and output numbers, Minnesota IMPLAN group (www.implan.com).

Mineral Information Institute, “Facts About Minerals”,
<http://www.mii.org/commonminerals.html>

Montana Code Annotated (MCA), 2005.

Montana Dept of Revenue, Biennial Report 2002-2004 and Biennial Report 2000-2002.

Montana Department of Revenue, Tax Policy and Research, personal communication, December 2005

Ockert, Susan, Montana Department of Commerce, Census and Economic Information Center (research and personal communication, November and December of 2005).

Reuters (London), “Gold Price Could Rise Higher”, December 8, 2005.

U.S. Bureau of Economic Analysis, Regional Economic Accounts.

U.S. Census--2002 Economic Census.

U.S. Department of labor, U.S. Labor Statistics, ‘Consumer Price Index for all Urban Consumers’.

U.S. Department of Labor, Bureau of Labor Statistics, ‘Quarterly Census of Employment and Wages’.

U.S. Geological Survey and the Montana Bureau of Mines, Montana State Minerals Information web page, 2003, <http://minerals.usgs.gov/minerals/pubs/state/mt.html>

U.S. Geological Survey and U.S. Dept of the Interior, “Mineral Production and Mining Trends for selected non-fuel commodities in Idaho and Montana, 1905 -2001, Historical Statistics for Mineral and Material Commodities in the United States”,
<http://minerals.usgs.gov>

U.S. Geological Survey, various publications including the Montana Mineral Yearbook (which has changed names over time), Historical Statistics for Mineral and Material Commodities in the United States, Mineral Commodity Summaries, 2003, and the U.S. Mineral Industry Survey.

Appendix A-Regulated Pollutants Commonly or Occasionally Found in Drainage Water at Mine Sites

Carcinogens

- arsenic
- beryllium
- pentachlorophenol (only if used in treating timbers in older underground mines)
- uranium
- beta and gamma emitters, radium, radon

Toxic Pollutants

- aluminum, dissolved (pH 6.5 to pH 9.0 only)
- total ammonia nitrogen
- antimony
- barium
- cadmium
- chromium, all forms
- chromium, hexavalent
- chromium, trivalent
- copper
- cyanide
- fluoride
- hydrogen sulfide
- lead
- mercury
- nickel
- nitrate
- nitrite
- oxygen, dissolved (below minimum values for aquatic life)
- selenium
- silver
- strontium
- thallium
- zinc

Pollutants that are neither carcinogenic nor toxic

- iron (harmful)
- manganese (harmful)
- total inorganic nitrogen (nutrient)
- phosphorus (nutrient)
- pH (harmful)
- turbidity (harmful)
- color (harmful)
- temperature (harmful)

Appendix B-Determining Ranges for Jobs, Wages and Economic Output in order to Estimate Future Mining Economic Activity in Montana

Economic Output and-Gross State Product Baseline Numbers³⁰

(All numbers in 2005 dollars)

From 1977 to 2002, the annual economic output (annual production value) of all metal mines production in Montana (metric tons times price in 2005 dollars) has ranged from \$149 million (1985) to \$743 (1991) million with an annual average of \$458 million. Economic output in 2002 was \$327 million.³¹ Taking out the highest and lowest years, gives a range of \$160 to \$582 million to use for estimated future mining economic output. From 1977 to 2002, industrial mineral mining in Montana (talc and stone) has ranged from \$41 million to \$77 million in annual economic output. Using the highest and lowest years gives a reasonable range. Economic output for mineral mining averaged \$57 million annually in that time period and was at the low end of the range in 2002³².

From 1977 to 2004, all mining in Montana including metal, industrial mineral, coal, and oil and gas, has ranged from \$466 million in annual Gross State Product (GSP) to \$1,662 million (1981) with an annual average number of \$911 million³³. GSP is a comparable value to economic output and is the total value of goods and services produced in the state on an annual basis. Total economic numbers for all mining and all of Montana's economy were only available in GSP. Taking out the highest and lower years gives a range of \$645 to \$1,474 million in GSP for all mining in Montana.

Montana's total GSP for its entire economy in those years ranged from \$6,390 million (1977) to \$23,913 million (2002), generally rising each year. Because of inflation, it is appropriate to use the latest 2002 number as a benchmark with the understanding that this number will grow on average each year due to the general trend of growth seen historically. As just mentioned, the average annual Gross State Product for all mining over those 28 years has been \$911 million annually in current dollars with lower than

³⁰ This data was compiled by Susan Ockert, Montana Department of Commerce, Census and Economic Information Center November 2005. Unless otherwise indicated, this data was obtained from the U.S. Bureau of Economic Analysis, Regional Economic Accounts. From 1977 to 1997, data was reported in SIC codes. From 1997 to 2004, data was reported in NAICS code. The change from SIC to NAICS code was a joint effort between the U.S., Canada and Mexico in order to be able to compare and track data for the North American Free Trade Agreement (NAFTA). The U.S. Census Bureau then implemented the agreement (Susan Ockert, Montana Department of Commerce, Census and Economic Information Center November 2005). There is some discrepancy in mining numbers between the SIC code and the NAICS code numbers, but not enough to significantly affect the results.

³¹ 'Mineral Production and Mining Trends for selected non-fuel commodities in Idaho and Montana', 1905 -2001, Historical Statistics for Mineral and Material Commodities in the United States, U.S. Department of Interior, and U.S. Geological Survey, <http://minerals.usgs.gov>

³² Data obtained from various publications from the USGS, such as the Montana Mineral Yearbook (which has changed names over time), Mineral Production and Mining Trends for selected non-fuel commodities in Idaho and Montana, 1905-2001, Historical Statistics for Mineral and Material Commodities in the United States, Mineral Commodity Summaries, 2003, and the US Mineral Industry Survey

³³ U.S. Bureau of Economic Analysis, Regional Economic Accounts,

average numbers in recent years. The range used in this impact statement is \$645 million to \$1,474 million. From 1997 to 2002, the percentage that all mining economic output comprises as a portion of Montana's total GSP has been in the 3.0% to 3.5% range. Metal mining and industrial mining, the industries affected by the rule, together average just over 1.2% of total economic output in Montana today

It is assumed that the economic output for future mining and metal mining will fall into the range of the past 28 years. Thus, for metals mining, the range used is a low of \$160 million (the second lowest year from 1977-2002), the mid-range number is \$327 million (output from 2002), and the high range number is \$582 million (the second highest year from 1977-2002). The same is done for industrial mineral mining (talc and stone only), where the low economic output number used is \$41 million, the middle number is \$57 million, and the high number is \$77 million.

Employment

From 1977 to 2004, employment for all mining in Montana (including coal mining and oil and gas) has ranged from 6,528 jobs to 12,589 jobs with an average number of 7,897 (U.S. Bureau of Economic Analysis, Regional Economic Accounts)³⁴. Taking out the highest and lowest years, gives a usable range of 6,709 to 10,634 for all mining. From 1977 to 2002, employment in metal mining in Montana has ranged from 1,157 jobs to 2,885 jobs.³⁵ Taking out the highest and lowest years gives a range of 1,378 to 2,785 jobs. Employment for metal mines averaged 2,183 from 1977-02 and was 2,127 in 2002. From 1977 to 2002, employment for industrial mineral mining has ranged from 350 to 636. 490 is a middle number between these two. Montana's total employment numbers for all jobs in the state from 1977-2004 averaged 486,420 with numbers generally rising each year and recent numbers just under 600,000. It is assumed that future total employment in Montana will average more than 600,000 due to the general trend of rising population and total employment in the state. From 1977 to 2004, the percentage that all mining comprises as a portion of Montana's total employment has been in the 1% to 3% range with recent numbers just over 1%. Metal mining and industrial mining put together average about 0.5% of total jobs in Montana today (U.S. Bureau of Economic Analysis, Regional Economic Accounts, U.S. Census--2002 Economic Census).

It is assumed that the employment for future metal mining and industrial mineral mining will fall into the range of what has occurred the past 28 years. Thus, for metals mining, a low range number is 1,378, a mid-range number is 2,183, and a high range number is 2,785. For industrial mineral mining, the low number is 350, the mid-number is 490 (halfway between the high and low number), and the high number is 636.

³⁴ The change from SIC to NAICS code was a joint effort between the U.S., Canada and Mexico in order to be able to compare and track data for the North American Free Trade Agreement (NAFTA). The U.S. Census Bureau then implemented the agreement (Susan Ockert, Montana Department of Commerce, Census and Economic Information Center November 2005). There is some discrepancy in mining numbers between the SIC code and the NAICS code numbers, but not enough to significantly affect the results.

³⁵ From 2001 to 2004, NAICS codes do not break out metal mining from other types of mining. 2001 and 2002 numbers were taken from the IMPLAN model run by Susan Ockert.

Personal Income

It is not instructive to look at long term ranges or averages for Montana mining personal income because those numbers are reported in real dollars and do not take into account inflation. If we look at the last five years of available data on personal wages for all mining in Montana, the average total wages paid out from 2000-2004 have been \$278 million annually (U.S. Bureau of Economic Analysis, Regional Economic Accounts). For metals mining from 1996-2000, this total annual wage number is \$92 million annually and was \$113 million in 2002.³⁶ We use \$92 million as a lower bound (considering that future inflation will generally lead to increased wages over time) and based on the upper metal mine job range estimate, \$150 million is used as an annual wage upper bound (for metal mining). For industrial minerals mining from 1996-2000, the 2002 wage number is \$7.7 million. Because talc and stone output is currently at the lower end of its range, this number is used as a lower bound. Based on the upper industrial mineral mining jobs range estimate, \$12.4 million is used as an upper bound for annual total wages. Montana's Total wage and salary disbursements from 2000-2004 averaged about \$11 billion with numbers generally rising each year and recent numbers being just over \$12 billion. From 1997 to 2004, the percentage that all mining comprised as a portion of Montana's total wage and salary disbursement has been around 2.5% whereas the portion that metal and industrial minerals has contributed has been just over 1% of Montana's total wage and salary disbursement..

The average wage in Montana for all types of mining is just over \$53,000 while compensation for all employees tied to the metal mining industry averages about \$40,000. With the high value of the metal, such as gold, silver, molybdenum, palladium and platinum, output per worker averages over \$150,000. On the other hand, output per worker for all industries supported by metal mining averages \$121,000 (Department of Labor and Industry, Research and Analysis Bureau web site)³⁷.

³⁶ From 2001 to 2004, NAICS codes do not break out metal mining from other types of mining.

³⁷ Calculated from 2004 and first quarter of 2005 by Susan Ockert.